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# INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

**APPOINTED UNDER A CONVENTION BETWEEN CANADA AND THE UNITED STATES FOR THE PROTECTION, PRESERVATION AND EXTENSION OF THE SOCKEYE SALMON FISHERIES IN THE FRASER RIVER SYSTEM**

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# ANNUAL REPORT
## 1958

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**COMMISSIONERS**

| | |
|---|---|
| **SENATOR THOMAS REID** | **ARNIE J. SUOMELA** |
| **A. J. WHITMORE** | **MILO MOORE** |
| **F. D. MATHERS** | **DeWITT GILBERT** |

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NEW WESTMINSTER
CANADA
1959

# INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

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## MEMBERS
## AND PERIOD OF SERVICE
## SINCE THE INCEPTION OF THE COMMISSION
## IN 1937

| CANADA | |
|---|---|
| William A. Found | 1937-1939 |
| A. L. Hager | 1937-1948 |
| Senator Thomas Reid | 1937- |
| A. J. Whitmore | 1939- |
| Olof Hanson | 1948-1952 |
| H. R. MacMillan, C.B.E., D.Sc. | 1952-1956 |
| F. D. Mathers | 1956- |

| UNITED STATES | |
|---|---|
| Edward W. Allen | 1937-1951<br>1957-1957 |
| B. M. Brennan | 1937-1942 |
| Charles E. Jackson | 1937-1946 |
| Fred J. Foster | 1943-1947 |
| Milo Moore | 1946-1949<br>1957- |
| Albert M. Day | 1947-1954 |
| Alvin Anderson | 1949-1950 |
| Robert J. Schoettler | 1951-1957 |
| Elton B. Jones | 1951-1957 |
| Arnie J. Suomela | 1954- |
| DeWitt Gilbert | 1957- |

INTERNATIONAL PACIFIC SALMON
FISHERIES COMMISSION

APPOINTED UNDER A CONVENTION
BETWEEN CANADA AND THE UNITED STATES FOR THE
PROTECTION, PRESERVATION AND EXTENSION OF
THE SOCKEYE SALMON FISHERIES IN
THE FRASER RIVER SYSTEM

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# ANNUAL REPORT
# 1958

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COMMISSIONERS

SENATOR THOMAS REID
A. J. WHITMORE
F. D. MATHERS
ARNIE J. SUOMELA
MILO MOORE
DeWITT GILBERT

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DIRECTOR OF INVESTIGATIONS
LOYD A. ROYAL

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NEW WESTMINSTER
CANADA
1959

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# REPORT OF THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION FOR THE YEAR 1958

The combined total of all sockeye salmon populations returning to the Fraser River in 1958 was an estimated 19,000,000 fish. It was the largest run on this cycle year in the 85 year history of the commercial fishery and it was the largest run of any year since the famous run in 1913. The record breaking size of the 1958 return was not wholly unexpected since all conditions during the freshwater existence of the eggs and young were known by the Commission to have been extremely favorable. The parent escapement was somewhat above the number of fish considered necessary to produce a maximum return and was properly timed with environmental conditions for successful spawning. Stream flows remained high during the period of incubation, the fry hatch was excellent and the number of seaward migrants was not only unusually large but their size was above normal for those produced from years of heavy spawning. That the 1958 run would mark the end of a period of very poor ocean survival, as represented by the small returning runs in the years 1955, 1956, and 1957, was indicated by a record breaking return of three-year-old males in 1957.

While nature provided for an exceptional return of sockeye in 1958, anomalies occurred in the migration pattern of the populations leaving their ocean feeding grounds. Each of the individual populations of sockeye, commencing with the Early Stuart run and continuing throughout the migration season, appeared in the fishery ten days later than they were normally expected and an unprecedented percentage of each run returned through Johnstone Strait. There is no available record of the Fraser River sockeye runs being as late in arrival or migrating in such proportions through the northern passage.

Several vagaries have occurred in the marine migration pattern of the Fraser sockeye populations during the last eight years. In 1954 the number of troll caught sockeye taken off the northern end of Vancouver Island was not significant being less than 1.73 per cent of the total Island troll catch. Likewise the Johnstone Strait catch by the net fishery was only 1.23 per cent of the total Fraser River catch. Troll catches off the west coast of Vancouver Island indicated that almost the entire Fraser run approached the southern half of Vancouver Island with few fish appearing in the northern section. Contrarywise the percentage of troll caught sockeye taken off the northern end of the Island rose to 39.22 per cent in 1957 and to 78.11 per cent in 1958. The percentage of the catch taken in Johnstone Strait was estimated at 16.01 per cent in 1957 and 29.0 per cent in 1958. It is evident from these data that while an unusually high percentage of the run approached from the north in 1957 the majority of the fish still moved down the west coast of Vancouver Island. In 1958 it would appear that practically the entire run approached from the north and for some reason diverted to Johnstone Strait in unprecedented numbers.

A study of ocean temperature conditions in recent years by J. P. Tully, A. J. Dodimead and S. Tabata of the Fisheries Research Board of Canada shows that the intrusion of warm water during August of 1955 and 1956 did not reach the northern end of Vancouver Island (Figure 1). In 1957, a relatively narrow band of warm water extended northerly to the northern end of the Queen Charlotte Islands and in 1958 a much greater mass of warm water spread westerly over a much wider area and equally as far north. Unfortunately the oceanographic studies are relatively recent although past records show a similar intrusion of warm water in 1936 when catch records indicate a high percentage of Fraser River sockeye migrated through Johnstone Strait. Only future observations will firmly establish that excessive warm water intrusion along the Pacific Coast was responsible for the diverted and delayed migration of the 1958 run but the strong possibility of a close relationship is certainly indicated. In this connection it is important to point out that the 1957 sockeye migrations were delayed beyond expectations but not to the unprecedented degree recorded in 1958. If periodic intrusion of warm water along the North Pacific Coast is responsible at least in part for delayed migration it cannot be established as yet whether the lateness is due to a delay in maturation or to the necessity of following a longer path of migration to reach the Fraser River or both.

The lack of cyclical continuity in the percentage of Fraser River sockeye migrating through Johnstone Strait suggests that the effects of oceanographic conditions upon the returning of the adult rather than esturial conditions during the passage of the young are responsible for the vagaries in the migration path of returning Fraser River salmon.

The importance of advance knowledge of the character of the season's inshore migration of both sockeye and pink salmon cannot be overemphasized in the fulfillment of the Commission's terms of reference. These terms of reference require not only an equal division of the season's catch in Convention waters but also an adequate escapement of each racial stock regardless of the proportions of each race approaching the Fraser from the north and from the Juan de Fuca Strait. Article VI of the Pink Salmon Protocol, which provides for a coordinated investigation of pink salmon stocks which enter Convention waters in order to determine the migratory movements of such stocks, will furnish much needed information on possible variations in the annual pattern of pink salmon migrations. A similar activity extended to the sockeye as they approach the Fraser River and a continuance of oceanographic studies along the west coast of Canada should provide the data now lacking for positive management of those Fraser River sockeye runs which depart from normal in the pattern of their inshore migration.

## COMMISSION MEETINGS

The International Pacific Salmon Fisheries Commission held eleven official meetings during 1958. The first of these meetings was held with the Advisory Committee on February 17. The provision of the Pink Salmon Protocol calling for one additional Advisory Committee member from each country was the first order of business. Mr. H. Stavenes was appointed as representative for the Canadian Fishing Vessel Crew Members, Mr. B. J. Johnson as representative for

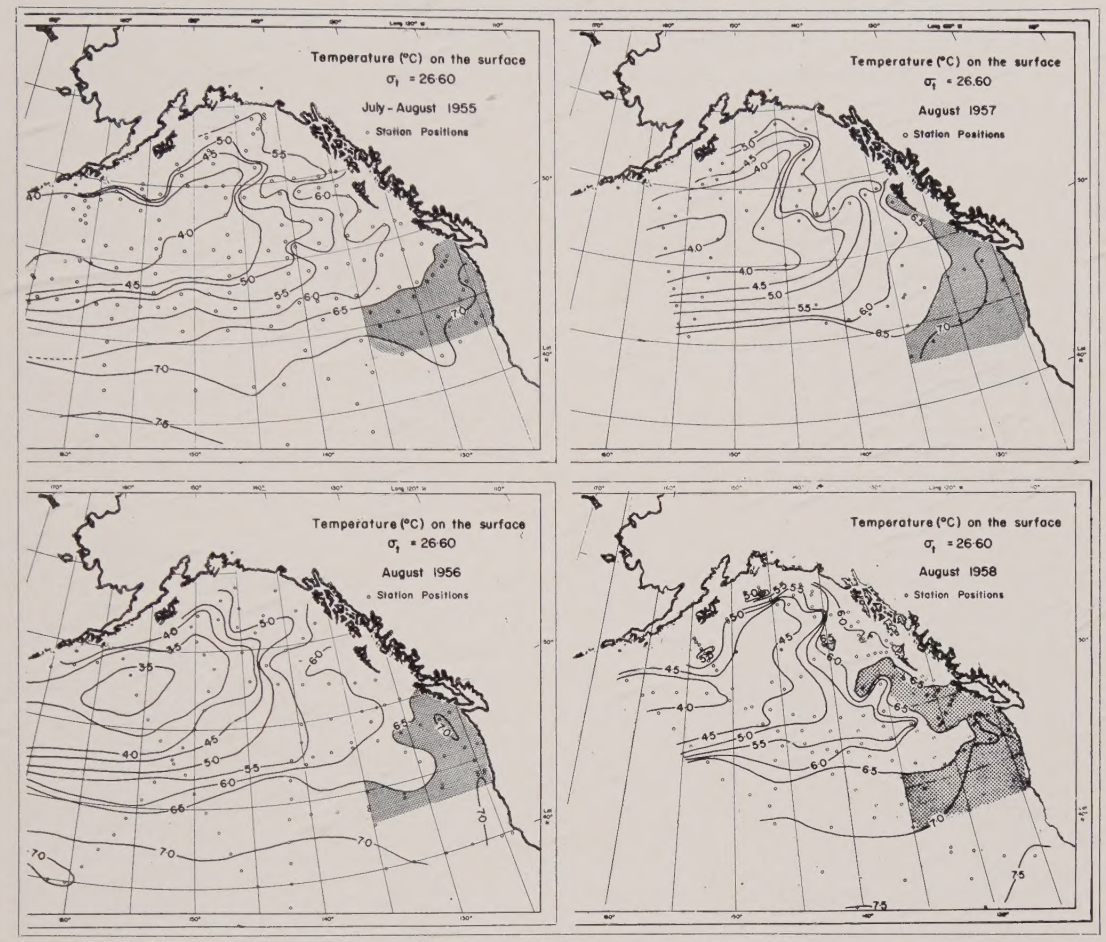


FIGURE 1 -- Superimposed on the annual cycle of heating and cooling, there was a progressive increase of temperature in the ocean off the Pacific Coast of Canada through 1957 and 1958. This is attributed to a northward intrusion of warm water at all levels from the surface to nearly 500 meters depth. It is difficult to recognize it in the upper 120 meters because of seasonal heating and cooling. It is shown (shaded) in these figures by the increasing areas occupied by the warmer waters, on the surface of constant density, which lies immediately below the level of seasonal effects.

REFERENCE

1959. Tully, J.P., A. J. Dodimead and S. Tabata.
An anomalous increase of temperature in the ocean off the Pacific Coast of Canada through 1957 and 1958. J. Fish. Res. Bd. of Canada. Submitted for publication (March 1959).

the United States Troll Fishermen and Mr. J. Brown as representative of the United States Reef Net Fishermen. The resignation of Mr. Chester Karlson, one of the original members of the Advisory Committee as representative of the United States Gill Net Fishermen, was announced and tribute paid to his many years of valuable service. Mr. J. Erisman was appointed as his successor. The membership of the Advisory Committee to the International Pacific Salmon Fisheries Commission follows:

| *United States* | *Canada* |
|---|---|
| John Plancich<br>Salmon Processors | Richard Nelson<br>Salmon Processors |
| N. Mladinich<br>Purse Seine Fishermen | Charles Clarke<br>Purse Seine Fishermen |
| Joe Erisman<br>Gill Net Fishermen | Peter Jenewein<br>Gill Net Fishermen |
| John Brown<br>Reef Net Fishermen | Steve Stavenes<br>Purse Seine Crew Members |
| Bert Johnson<br>Troll Fishermen | Herbert North<br>Troll Fishermen |
| Howard Gray<br>Sport Fishermen | M. W. Black<br>Sport Fishermen |

The tentative recommendations for regulatory control of sockeye fishing in Convention waters, as submitted to the Advisory Committee on December 16, 1957, were discussed and revisions made in view of the discussions with the Advisory Committee. The recommended regulations for the 1958 sockeye fishery in Convention waters were approved for submission to the two national governments and to the Director of Fisheries for the State of Washington on February 24.

On July 14 the Commission met for a general business meeting to review the present status of such projects as the activities of the Pink Salmon Co-ordinating Committee, rehabilitation, proposed hydroelectric and flood control projects, production of the film "The Sensitive Sockeye" and the existing oceanographic conditions with their possible effects on the 1958 sockeye run. The budget estimates for the fiscal year of 1959-1960 were approved for submission to the Governments of Canada and of the United States.

The apparent change in both the timing and the migration route of the 1958 sockeye runs necessitated the third meeting of the year on August 5 when the situation was fully considered, together with the possible regulatory changes which would be required to obtain the desired catch-escapement ratio for each population of sockeye. A meeting with the Advisory Committee was then scheduled for August 14 when all of the factors affecting the management of the 1958 sockeye runs were considered and the required emergency regulatory recommendations were made to meet the situation. The fifth, sixth and seventh meetings of the year were all necessitated by the need for further emergency regulatory action in an attempt to fulfill the Convention obligations. These meetings were held on August 27 in Bellingham, Washington, and September 3 and 8 in New Westminster, British Columbia.

The eighth meeting of the Commission was held with the Advisory Committee on September 11. At this time a full review of the season's catch and

escapement pattern was given. It was emphasized that the volume of Adams River sockeye delaying in the Strait of Georgia contained a considerable number of late run fish which should be taken by the commercial fishery after proper escapement was obtained. The Chairman briefly outlined plans for the "Salute to the Sockeye" Centennial celebration at Adams River. There was an inaugural showing of the recently completed film "The Sensitive Sockeye".

An emergency session of the Commission was held on October 30 in New Westminster, British Columbia. An adequate escapement of top quality spawners had already arrived on the Adams River spawning grounds and the late running fish, which had not been taken by the commercial fishery because of economic differences within the Canadian industry, were beginning to arrive and jeopardize the productivity of the spawning area. It was decided to install an electric fence immediately, subject to approval by the Canadian Government, to divert the excess escapement to the beaches along the shore of Shuswap Lake.

The Commission held its tenth meeting on November 19 to review the season's activities.

The eleventh and final meeting of the year was held on December 15 and 16. It was recognized by the Commission that additional laboratory facilities would be required as soon as possible to permit expansion of essential studies of various factors, including pollution and potential dams, which could affect the productivity of Fraser River sockeye and pink salmon. On December 16 the Commission met with its Advisory Committee, at which time Dr. J. P. Tully of the Fisheries Research Board of Canada addressed the meeting with respect to studies conducted by the Pacific Oceanographic Group on recent oceanographic patterns and their possible effect on sockeye migration. Mr. C. E. Atkinson representing the United States Scientific Section, International North Pacific Fisheries Commission then reported on the results of racial studies conducted by their organization on salmon stocks of 1956, 1957 and 1958 feeding in the North Pacific Ocean which showed that Fraser River sockeye are not taken westerly of 175° west longitude. A full review of the 1958 season, a presentation of the run-size expectations for the 1959 season, and the suggestions for regulatory control of pink and sockeye fishing in Convention waters for 1959 were presented to the Advisory Committee for their further consideration.

## 1958 REGULATIONS

Recommendations for regulations governing the 1958 sockeye fishery in Convention waters were adopted at a meeting of the Commission held with its Advisory Committee on February 17, 1958. The regulatory recommendations were submitted to the Governments of the United States and Canada and the State of Washington on February 24, 1958. The regulations were accepted for United States waters by an Order of the Director of the State of Washington Department of Fisheries on April 4, 1958, and for Canadian waters by an Order-in-Council on June 26, 1958.

The recommendations of the Commission were as follows:

**United States Convention Waters**

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends to the Director of Fisheries of the State of Washington that regulations to the following effect, in the interests of such fisheries, be adopted by him for the year 1958 by virtue of authority in him vested by Section 6 of Chapter 112 of the Laws of the State of Washington of 1949, namely:

In the United States Convention waters of the Strait of Juan de Fuca lying westerly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia:

(a) Taking sockeye salmon shall be prohibited from six o'clock in the forenoon of Monday the 23rd day of June, 1958 to six o'clock in the afternoon of Sunday the 10th day of August, 1958.

In the Convention waters of the United States of America lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia:

(a) Taking sockeye salmon shall be prohibited from six o'clock in the forenoon of Monday the 23rd day of June, 1958 to four o'clock in the forenoon of Monday the 21st day of July, 1958.

(b) Taking sockeye salmon by means of purse seine and reef net fishing gear shall be prohibited from eight o'clock in the afternoon of Wednesday of each week to four o'clock in the forenoon of the Monday following and from eight o'clock in the afternoon until four o'clock in the forenoon of the following day during such times as sockeye fishing by purse seine and reef net fishing gear is not otherwise prohibited and by means of gill net fishing gear from eight o'clock in the forenoon of Thursday of each week to six o'clock in the afternoon of the Monday following and from eight o'clock in the forenoon until six 'clock in the afternoon of each day during such times as sockeye fishing by gill net fishing gear is not otherwise prohibited between the 21st day of July, 1958 and the 9th day of August, 1958, both days inclusive.

In all of the Convention waters of the United States of America lying easterly of a straight line drawn from Bonilla Point in the Province of British Columbia to the lighthouse on Tatoosh Island in the State of Washington:

(a) Taking sockeye salmon by means of purse seine and reef net fishing gear shall be prohibited from eight o'clock in the afternoon of Wednesday of each week to four o'clock in the forenoon of the Monday following and from eight o'clock in the afternoon until four o'clock in the forenoon of the following day during such times as sockeye fishing by purse seine and reef net fishing gear is not otherwise prohibited and by means of gill net fishing gear from eight o'clock in the forenoon of Wednesday of each week to six o'clock in the afternoon of the Sunday following and from eight o'clock in the forenoon until six o'clock in the afternoon of each day during such times as sockeye fishing by gill net fishing gear is not otherwise prohibited

between the 10th day of August, 1958 and the 16th day of August, 1958, both days inclusive.

(b) Taking sockeye salmon by means of purse seine and reef net fishing gear shall be prohibited from eight o'clock in the afternoon of Friday of each week to four o'clock in the forenoon of the Monday following and from eight o'clock in the afternoon until four o'clock in the forenoon of the following day during such times as sockeye fishing by purse seine and reef net fishing gear is not otherwise prohibited and by means of gill net fishing gear from eight o'clock in the forenoon of Friday of each week to six o'clock in the afternoon of the Sunday following and from eight o'clock in the forenoon until six o'clock in the afternoon of each day during such times as sockeye fishing by gill net fishing gear is not otherwise prohibited between the 17th day of August, 1958 and the 14th day of September, 1958, both days inclusive.

In the Convention waters of the United States of America lying westerly of a straight line drawn from the Iwersen Dock on Point Roberts in the State of Washington to the flashing white light on Georgina Point at the entrance to Active Pass in the Province of British Columbia:

(a) Taking sockeye salmon shall be prohibited between the 31st day of August, 1958 and the 20th day of September, 1958, both days inclusive.

All times hereinbefore mentioned shall be Pacific Standard Time."

**Canadian Convention Waters**

"The International Pacific Salmon Fisheries Commission appointed pursuant to the Convention between Canada and the United States of America for the protection, preservation and extension of the Sockeye Salmon Fisheries in the Fraser River System, signed at Washington on the 26th day of May, 1930, as amended by the Pink Salmon Protocol signed at Ottawa on the 28th day of December, 1956, hereby recommends that regulations to the following effect, in the interests of such fisheries, be adopted by Orders-in-Council as amendments to the Special Fishery Regulations for British Columbia, for the season of 1958, under the authority of the Fisheries Act, namely:

In the Canadian Convention waters of the Strait of Juan de Fuca lying westerly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia:

(a) Taking sockeye salmon shall be prohibited from five o'clock in the forenoon of Monday the 23rd day of June, 1958 to five o'clock in the afternoon of Saturday the 9th day of August, 1958; provided that nothing in this recommendation shall militate against the taking of sockeye salmon by trap fishing gear from seven o'clock in the forenoon of Monday to seven o'clock in the forenoon of the Thursday following of each week from June 23rd to August 9th, 1958, if such fishing by trap fishing gear is permitted by the Government of Canada.

(b) Taking sockeye salmon by means of purse seine fishing gear shall be prohibited from five o'clock in the afternoon of Friday of each week to five o'clock in the forenoon of the Sunday following and from five o'clock in the afternoon until five o'clock in the forenoon of the following day during such times as sockeye fishing by purse seine fishing gear is not otherwise prohibited and by means of gill net fishing gear from five o'clock in the forenoon of Friday of each week to five o'clock in the afternoon of the Saturday following and from five o'clock in the forenoon until five o'clock in the afternoon of each day during such times as sockeye fishing by gill net fishing

gear is not otherwise prohibited and by trap fishing gear from five o'clock in the forenoon of Saturday of each week to five o'clock in the forenoon of the Sunday following, between the 9th day of August, 1958 and the 6th day of September, 1958, both days inclusive.

In the Convention waters of Canada lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia, including all of District I and Areas 17, 18 and that part of Area 19 not otherwise regulated in the foregoing paragraphs:

(a) Taking sockeye salmon shall be prohibited from seven o'clock in the forenoon of Thursday of each week to seven o'clock in the forenoon of the Monday following between the 23rd day of June, 1958 and the 18th day of August, 1958, both days inclusive.

In the Convention waters of Canada lying easterly of a line drawn from the bell buoy off Point Grey to the light on the north westerly end of the North Arm Jetty thence to Sand Heads light thence to Canoe Pass buoy and thence true south to the international boundary line:

(a) Taking sockeye salmon shall be prohibited from seven o'clock in the forenoon of Wednesday of each week to seven o'clock in the forenoon of the Monday following between the 19th day of August, 1958 and the 15th day of September, 1958, both days inclusive.

(b) Taking sockeye salmon shall be prohibited between seven o'clock in the forenoon of the 15th day of September, 1958 and seven o'clock in the forenoon of the 23rd day of September, 1958.

In the Convention waters of Canada lying easterly of a straight line drawn from Angeles Point in the State of Washington across Race Rocks to William Head in the Province of British Columbia, including all of Areas 17, 18 and that part of Area 19 and District I *not otherwise regulated in the foregoing paragraphs:*

(a) Taking sockeye salmon shall be prohibited from seven o'clock in the forenoon of Wednesday to seven o'clock in the forenoon of the Monday following between the 19th day of August, 1958 and the 25th day of August, 1958, both days inclusive.

(b) Taking sockeye salmon shall be prohibited from seven o'clock in the forenoon of Saturday of each week to seven o'clock in the forenoon of the Monday following between the 26th day of August, 1958 and the 15th day of September, 1958, both days inclusive.

(c) Taking sockeye salmon shall be prohibited between seven o'clock in the forenoon of the 15th day of September, 1958 and seven o'clock in the forenoon of the 23rd day of September, 1958.

All times hereinbefore mentioned shall be Pacific Standard Time."

**Emergency Amendments**

Unprecedented variations in both the migration time and route necessitated important modifications in the approved regulations to realize equal division of the catch and adequate racial escapement.

The first of these actions was taken on August 8, in both Canadian and United States Convention waters. It was a well established fact that an unusually

high percentage of the Fraser River sockeye runs were coming through Johnstone Strait and that the runs were late. Since the opening date in Juan de Fuca Strait was originally scheduled to start with the normal timing of the Adams River run the opening date in all Convention waters westerly of the Angeles Point-William Head line was delayed one week to 5:00 p.m. August 16 for gill nets, 5:00 a.m. August 17 for purse seines in Canadian waters and until 6:00 p.m. August 17 for gill nets and 4:00 a.m. August 18 for purse seines in United States waters.

By August 15 it was obvious that the Adams River run would be a full 10 days late in arriving, which necessitated a further delay of four days in the opening of Juan de Fuca Strait. At the same time the weekly closed time for all gear in the Straits area was increased by 24 hours to offset the expected deficit in potential escapement on earlier runs as a result of the Johnstone Strait diversion. To provide for the desired escapement of the mid-summer runs it was necessary also at this time to extend the weekly closed time in United States waters easterly of the Angeles Point-William Head line by three days making the opening time for gill nets 6:00 p.m. August 20 and for purse seines and reef nets 4:00 a.m. August 21. Also on August 15, as a further requirement for escapement, the weekly closed time in Canadian waters easterly of the Angeles Point-William Head line was increased by 3 days opening at 7:00 a.m. August 21 instead of 7:00 a.m. August 18 with fishing being permitted for 48 hours during that week. The weekend closure was then extended in Canadian waters easterly of the Angeles Point-William Head line excepting the Fraser River, until 7:00 a.m. August 27 and in the waters of the Fraser River until 7:00 a.m. August 28. Fishing was then permitted in both of the above areas until 7:00 a.m. August 30. Fishing was permitted after August 30 from 7:00 a.m. Monday to 7:00 a.m. Saturday in the Gulf area and from 7:00 a.m. Monday to 7:00 a.m. Wednesday in the Fraser River inside of the 'Blue Line'.

On August 18, due to an unexpected large escapement through Puget Sound, it was possible to decrease the recommended closure in United States waters by 24 hours thus permitting gill nets to start at 6:00 p.m. August 19 and close at 8:00 a.m. August 22 and purse seines and reef nets to start at 4:00 a.m. August 20 and close at 8:00 p.m. August 22 followed by a two day closure then reverting to the original regulations for the following week. Also on August 18, because of the lateness of the run, the proposed closure for United States waters westerly of a straight line drawn from Iwersen's Dock on Point Roberts toward the Active Pass light was delayed for one full week, making the closed period in this area effective from September 7 to September 27.

By August 27 a serious lag of 700,000 sockeye had developed in the United States share of the season's catch. At a meeting of the Commission on the above date it was decided to forego any weekend closures in the United States waters easterly of the Angeles Point-William Head line until an equitable division of catch had been obtained. This regulation remained in effect until September 17 when the Commission relinquished regulatory control in United States waters excepting the West Point Roberts area. Under regulation of the Washington

State Department of Fisheries a 72 hour weekly closure was in effect for the remainder of the season.

On September 3 the unprecedented high fishing efficiency of the Canadian fleet operating in the waters westerly of the Angeles Point-William Head line, and the continuing disparity in the catch of the two nationals, necessitated a closure of the area on September 5 and 8. After consideration of all of the pertinent data it was found necessary to re-impose the closure in the Canadian portion of the Straits area after 24 hours fishing time on September 9 to continue until 5:00 p.m. September 14. At the same time fishing in the Canadian waters of Areas 17, 18 and that portion of Area 19 easterly of the Angeles Point-William Head line was closed indefinitely as of 7:00 p.m. September 9 in an effort to conserve the small stock of early arriving sockeye especially adapted for escapement but still "drifting" in that area.

Careful analysis of all available data on September 19 indicated that the upriver movement of Adams River sockeye would be negligible by September 23 so the existing closure of all Canadian waters easterly of the Angeles Point-William Head line was extended to September 30. Also on this date the closure line in the West Point Roberts area was changed to a straight line extending true south from Point Roberts light to its point of intersection with the international boundary. Large catches of "drifting" sockeye resulted in this line again being moved on September 24, closing all United States waters westerly of a line drawn true south from Lilly Point on the Point Roberts Peninsula to its point of intersection with the international boundary. On September 27 to accomplish division of the catch between nationals the West Point Roberts closure was abrogated; however, an excessive driftback on September 30 accompanied by a large catch of delaying sockeye resulted in the re-establishment of the West Point Roberts closure westerly of a line extended from the Iwersen Dock toward the Active Pass light. This closure was repealed for the season effective the evening of October 6.

On September 26 it was obvious that an adequate upriver movement of Adams River sockeye would not occur by September 30 so the closure of the waters easterly of the Angeles Point-William Head line was extended an additional week to October 6. As of October 3 adequate upriver escapement was still to be obtained, hence the closure was extended to 8:00 a.m. October 8, subject to revision if any change developed in the expected migration pattern before that date. By the morning of October 6 the daily sockeye escapement had increased substantially and an opening time of 10:00 a.m. October 7 was approved. With this action the Commission relinquished control of regulations for 1958 in all Canadian Convention waters.

Under provisions of the British Columbia Fishery Regulations District No. 1 was open to fishing from 10:00 a.m. October 7 to 8:00 a.m. October 10 with 4 days fishing permitted during the week of October 13-19 then two days per week during the last two weeks of October with a closure being in effect from October 31 to November 10.

# SOCKEYE SALMON REPORT

## The United States Fishery

The sensitive effect of regulations on a highly efficient fishery has been emphasized in previous annual reports. The United States fishing fleet is now capable of catching approximately 100 per cent of the mid-summer runs of sockeye when it is operating hence a three day fishing week is usually essential if the United States catch is to be limited to 40 per cent of these runs. This restriction is designed to allow a catch of 40 per cent of the runs by Canadian fishermen operating either in Juan de Fuca Strait or in the Fraser River area or in both areas together and a 20 per cent escapement. One day's fishing either below or above the required intensity in any of the three major fishing areas (Juan de Fuca Strait, Puget Sound and the Fraser River) can seriously upset either division of the season's catch or the proper racial catch-escapement ratio. Fishing regulations must be set in Convention waters prior to the opening of the fishing season and they are based on the predicted size of the runs, the anticipated efficiency of the fishing fleets, and assumed normalcy of migration pattern in relation to time and place. Any significant variation in the actual conditions from those anticipated can only result in important modification of the established fishing regulations if proper management of the fishery is to be obtained.

The opening of the United States fishery was delayed until July 21 because of the expected small size of the early runs and the need of a surplus in the Canadian catch if the United States fishery was to operate on a three-day-week basis during the early and mid-summer runs of sockeye. The delayed development of the catch in the Fraser River during the early July period combined with a daily racial analysis of the catch from scale samples indicated that the peak of the early run was ten days late and that the catches were far below their anticipated size even though compensation was made for the delay in arrival (Table IV). Fortuitous scale sampling of unexpected high catches in Johnstone Strait indicated that a substantial part of the early runs were diverting to the northern inside passage and the relation of the size of the Johnstone Strait catches to those of the Fraser River area indicated a relatively small escapement from the northern fishing area.

After the season opened in United States waters on July 21, and until August 14, scale analysis of the catch indicated a continuation of the ten day delay in the arrival of all early summer runs of sockeye. In addition, catches of Fraser sockeye in Johnstone Strait when compared with catches in either United States waters or the Fraser River area indicated the continued diversion of a substantial part of the runs through the northern approach channel. Daily catches in the northern area were from two to four times the daily catches in either the Fraser River or in Puget Sound. By August 14 emergency action was necessary in both United States and Canadian Convention waters if adequate escapement was to be obtained from the races of sockeye entering Convention waters after July 21. The opening of the fishery in Juan de Fuca Strait originally scheduled for August 10 was delayed until August 20 since the opening of this area was timed for the appearance of the Adams River run of sockeye. A six day closure was placed

in effect in Puget Sound waters effective August 14. During this period the peak of the summer runs of sockeye appeared and the desired escapement of these sockeye was obtained through United States Convention waters. Test fishing at Lummi Island and field observations indicated a minimum escapement estimate of between two and three hundred thousand sockeye to the mouth of the Fraser River.

With the appearance of the Adams River run, which is noted for its ability to escape fishing gear due to the "wildness" of the fish, and for its characteristic of swimming deeper than other races of sockeye, it became obvious that division of the catch would not be obtained unless further emergency action was applied. A reduction in fishing efficiency combined with increased regulatory restriction in Johnstone Strait indicated a sizeable increase in the percentage escapement of the Adams River run from this latter area. Weekly closed seasons were therefore eliminated on August 27 in Puget Sound waters to allow United States fishermen to approach equality of catch with Canadian fishermen in Convention waters. The combination of a seven-day fishing week during the Adams River run combined with periodic opening of a portion of the West Point Roberts area enabled the United States fishermen to take 5,257,316 sockeye during the season or 50.07% of the total catch in Convention waters (Table II). Although a surplus escapement of substantial size eventually occurred to the Adams River area this surplus consisted of late running fish which presumably were mixed with the early arriving fish in the delaying area off the mouth of the Fraser River. Since the estimate of available 'quality spawners' was not above that required, any further fishing to reduce the surplus would have jeopardized that part of the escapement considered suitable for maximum production.

The distribution of the United States catch between gear (Table I) was about the same as in the preceding cycle. Gill net catches in the San Juan Island area averaged 74.0 sockeye during the peak of the Adams River run as compared with 48.6 fish in 1954. This increase was offset by a drop in the average catch of gill nets in the Point Roberts area. In 1954 the average Point Roberts gill net landing during the Adams River migration was 70.2 sockeye as compared with only 29.4 sockeye per landing in 1958. A final determination of whether the drop in the 1958 gill net landing at Point Roberts was caused by the heavy catch of sockeye before the fish reached the Point Roberts area or by a change in availability or both awaits further statistical analysis.

A complete statistical record of the 1958 catch compared with that for previous cycle years in both United States and Canadian Convention waters may be found in Tables I to IV inclusive.

In summary it may be stated that the larger share of the Adams River escapement reached the Fraser River via Johnstone Strait. The season's catch of 5,257,316 fish was the largest catch of sockeye in United States waters in 45 years and the largest of any cycle year in the history of the United States fishery.

**The Canadian Fishery**

The Canadian fishery harvested a total of 5,241,617 sockeye or 49.93 per cent of the total catch in Convention waters (Table II). Gill nets caught

2,680,914 sockeye as compared with 2,541,592 taken by purse seines operating principally in Juan de Fuca Strait. An important factor in the 1958 Canadian fishery was the unusual rise in efficiency of the fishing fleet in Juan de Fuca Strait. A preliminary analysis of the unit efficiency of the fleet indicates a rise of about 100 per cent over that previously recorded. With no important change in the character of the gear used in 1958 from that in use in the preceding few years it is difficult to define the reason for this drastic rise in gear efficiency. The only logical explanation is that the sockeye were actually drifting in the area thus making available a greater number of sockeye than that represented by the daily migration of fish through the fishing area.

Regardless of the exact cause for what appears to have been an abnormal increase in fishing efficiency in the Juan de Fuca Strait area, emergency restrictions were necessary to bring about the required equitable division of the total catch between the two national groups of fishermen. In respect to increased fishing efficiency in the Canadian Straits area it is interesting to note that the net fishery harvested 2,811,285 sockeye during 13 days of fishing in 1958 compared with 1,669,111 sockeye taken during about 29 days of fishing in 1954.

While equitable division of the actual catch between the fishermen of the United States and Canada was obtained, a surplus escapement occurred after October 7 when the Fraser River area was opened to fishing. The escapement of at least 1,500,000 fish undesirable for spawning purposes was caused by disagreement within the industry as to the quality of the fish available to be caught and the price to be paid for them.

It is recognized that long delaying sockeye and pink salmon do not have the equivalent oil content and other desirable characteristics of the faster moving fish of the same species but it is impossible to design regulations to avoid the necessity of taking some of these fish in the interest of sound management. The acceptance of these facts by the industry is essential to a properly managed fishery. Allowing an intense fishery on late running fish prior to their entering the delay area off the mouth of the Fraser is recognized as a desirable form of regulation but as previously stated such regulation in practice cannot entirely eliminate the problem.

**Escapement**

The net sockeye escapement recorded on the spawning grounds of the Fraser River watershed was 3,816,114 fish (Table VI) or 20.08 per cent of the total season's run estimated at 19,000,000 sockeye. The balance of the run is accounted for by a catch of 10,498,933 fish in Convention waters, a catch of sockeye of Fraser River origin estimated at 4,280,000 fish in Johnstone Strait and an Indian catch of 82,365 fish. This leaves a total of 322,588 fish which is a reasonable figure for those fish that escaped the fishery but failed to reach the spawning grounds.

It was a difficult year to obtain a balanced racial escapement because of the lateness of the runs, the Johnstone Strait diversion, and the tendency of the later segments of the fall migrating runs to delay excessively in the Gulf of Georgia before moving up the Fraser River. Closures of the fishery in Convention waters

during mid-August allowed adequate numbers of early run sockeye to reach the mouth of the Fraser River, but a large segment of the Stellako population remained in the Gulf of Georgia instead of proceeding upstream in a normal manner. A scale analysis of test fishing catches during the mid-August closure on the Fraser River revealed a heavy escapement to the late Stuart, Chilko and Seymour River systems but only a minimum number of fish destined for the Stellako River. With record breaking escapements already recorded en route to the former areas it was not practical to prolong the river closure to obtain adequate escapement of Stellako fish. A large segment of the Stellako run remained in the Gulf of Georgia until September 25 when it started upstream with the first of the Adams River run. This segment of the Stellako run, estimated at 75,000 to 100,000 fish, was recorded passing Bridge River Rapids in early October but none of these fish ever reached the spawning grounds. Over 300 of these late migrating sockeye were found attempting to spawn in Cayoosh Creek of the Seton-Anderson system and a few were observed near Quesnel, B.C.

In general, the individual escapements were satisfactory, with important increases registered in Seymour, Horsefly, Middle and Tachie Rivers. The large escapement to Chilko is considered excessive and undesirable in view of the fact that the 1958 cycle normally is low in productivity. Pending further biological evidence the current principle of management requires that the escapement during the off-years of production in each spawning area be kept at a low level to avoid possible conflict of year classes and possible lowered total yield. The continuous existence of these cycle years of low production has been noted as far back as 1820 long before the existence of a commercial fishery.

A continuation in the decline of the cyclical escapements to Birkenhead and Pitt Rivers was recorded. Several possible causes for the continued decline in these runs are being investigated. It is impractical to reduce the fishing mortality on these two runs since their migration times overlap other large populations in the fishery which are increasing in abundance. If low fry production due to unstable spawning grounds proves to be the cause for the decline of the Pitt and Birkenhead runs, an improved system of artificial propagation may be developed in an attempt to offset the declining trend in the size of the sockeye populations produced by these two systems.

Between 1,700,000 and 2,000,000 sockeye destined for Adams River escaped the Lower River fishing area prior to the official opening of the fishery in that area on October 7. These fish constituted that part of the population remaining in the Gulf of Georgia having the greatest potential for reproducing this important population of fish. The number of fish escaping prior to October 7 also represented the number required for adequate escapement. An additional estimated total of well over 1,000,000 Adams River sockeye, which normally would have been harvested had fishing operations continued, escaped the fishing area after October 7. While many of these late fish failed to reach the spawning grounds, it soon became obvious that a substantial number would reach Adams River resulting in overspawning and a generally adverse condition for maximum reproduction.

On November 2 an electric fence was installed at the mouth of Adams River to prevent the entrance of the late arriving poor quality spawners. Approximately 1,000,000 sockeye were prevented from entering Adams River and these fish spawned on adjacent lake shore beaches and in Little River. Post spawning investigations revealed that excellent survival up to hatching occurred in Adams River and excessive mortality occurred in the areas where the late migrating fish spawned, particularly on the beaches of Shuswap Lake where the spawning areas were exposed by receding winter water levels. It is unfortunate that practical difficulties prevented the elimination of late spawning fish in the Little River spawning area as well as in that of Adams River. Whatever the total effects of the vagaries in the 1958 escapement may be on the returning run in 1962, it is certain that the prevention of late spawners from entering Adams River was a necessary function of proper management.

**Rehabilitation**

The success of eyed egg transplants as a means of inaugurating sockeye runs to barren areas of the Fraser River watershed was firmly established for the first time in 1958. A planting of eyed eggs in Portage Creek in 1950 resulted in a returning escapement through the fishery of 3,505 sockeye in 1954. The 1954 escapement was allowed to spawn naturally with no additional transfer of eyed eggs made in that year. The 1954 natural spawning in Portage Creek not only returned a run of sockeye to that area but provided for an increased run sufficient to allow an escapement through the fishery of 4,803 adults. By selecting a donor stream (Lower Adams River) which has approximately the same reproductive environment in respect to water temperature, and which is located about the same distance from the sea as the receiver stream, a run of sockeye has been created which is capable of a rate of natural reproduction apparently equal to that of the original stock in its native freshwater environment.

A run of sockeye returned in 1958 for the second successive cycle year to Upper Adams River. An escapement of 205 fish was recorded in 1954 as a result of an eyed egg transplant from the Seymour River in 1950. However, it cannot be stated that the second return in 1958 is the entire result of natural spawning in 1954 since eyed eggs were again transferred in the latter year from the Seymour River. It was impractical to accurately enumerate the escapement to Upper Adams River in 1958 because of turbid water but it was established that the escapement was greater than in the brood year.

A transplant of 1,396,000 eyed eggs in 1954 from Lower Adams River to the Middle Shuswap River above Mabel Lake resulted in a return of 499 adults which spawned in the vicinity of Bessette Creek. An eyed egg transplant to the Little Horsefly River from Lower Adams River in 1954 was almost a failure returning only 14 sockeye. The timing of the return was similar to that of Lower Adams River substantiating that the fish must have originated from the transfer of eggs from Lower Adams River in 1954.

A transplant of eyed eggs from Seymour River to Salmon River near Salmon Arm, B.C., failed to return a single sockeye to the receiver stream in 1958. Sampling during the winter following the transplant indicated a high mortality of

the eggs as a result of suffocation. The gravel beds for later transplants have been more carefully selected and eventual success should be obtained in re-establishing a small run of sockeye to the Salmon River.

The transplantation of eyed eggs in 1958 was as follows:

1. A transfer of 850,000 eyed eggs of Taseko Lake origin to Upper Adams River.
2. A transfer of 483,000 eyed eggs of Seymour River origin to Upper Adams River.
3. A transfer of 582,000 eyed eggs of Raft River origin to Barriere River.
4. A transfer of 273,000 eyed eggs of Seymour River origin to Eagle River below the junction with the North Fork.
5. A transfer of 283,000 eyed eggs of Seymour River origin to Salmon River.
6. A transfer of 3,429,000 eyed eggs of Stellako River origin to the Quesnel Field Station where 807,000 were incubated in the artificial spawning ground and 2,622,000 were incubated in the hatchery. An effort is being made to greatly increase the number of fry liberated into Horsefly Lake since relatively small releases of fry from the artificial spawning ground have failed to produce any significant number of seaward migrants.

**General Investigations**

The primary research activity of the Commission since its inception in 1938 has been directed to establishing the relationship of the sockeye salmon to its freshwater environment and the tolerance of the species to possible changes in that environment. This activity has now been expanded to include the pink salmon (1957). Without a thorough knowledge of the ecological structure of the freshwater environment required for maximum reproduction of sockeye and pink salmon we cannot design complete formulas for the management of the fishery; determine the adaptability of the species to physical, chemical or biological changes in the environment; or develop successful artificial methods for maintaining or increasing the individual populations.

The utilization of knowledge obtained to date has brought about a substantial increase in the sockeye populations reproducing in the Fraser River watershed and has provided the basis for an eventual increase in the pink salmon populations. The increasing number and accuracy of the seasonal predictions by the Commission is further evidence of the importance of the accumulating knowledge which has been obtained through scientific research. Additional information from current and future research is essential if we are to fully measure in advance the possible physical, chemical and biological changes that may be brought about by the multi-purpose development of the Fraser River and recommend the necessary modifications in that development when it is practical to do so for the protection of the fishery resource. If artificial methods are to be used for maintaining or increasing individual populations of sockeye and pink salmon of the Fraser River watershed additional information is definitely required before the success of these methods can be assured.

The urgent need for the additional information required for the protection

FIGURE 2 — Winter survival studies of [illegible] sockeye eggs seeded in the gravel beds of Upper Adams River. A protective cover of four feet of snow and eighteen inches of ice must be removed from the sample areas staked out in the Fall for later identification.

of the salmon resource has brought about the creation of a Fisheries Development Council sponsored by the Department of Fisheries of Canada. The Council is made up of representatives of those organizations directly responsible for or interested in the preservation of the fisheries resources of British Columbia. One of the functions of the Council is to coordinate biological and engineering research pertaining to the protection of the fisheries resource. As a member of the Council the Commission has a responsibility to coordinate certain of its research activities and periodically to report its findings in a mutual exchange of information. The current research program being conducted by fisheries research agencies who are all members of the Council is as follows:

**Basic Biological Research**

1. Performance Studies — to determine the ability of salmon and trout to swim, or perform other functions under given environmental conditions.
2. Tolerance Studies — to determine the physical and chemical limits within which salmon and trout may successfully complete various stages in their life history.
3. Perception Studies — to determine the array and sensitivity of salmon and trout sense organs to natural or artificial stimuli.
4. Behaviour Studies — to delimit and define the types of behaviour exhibited by salmon and trout and to determine the effects of various environmental stimuli upon this behaviour.
5. Racial Studies — to determine the types of racial characteristics present in salmon and trout stocks and to examine causes, environmental, genetic, or both for these differences.
6. Biological Studies — to examine the biochemistry and physiology of salmon and trout in relation to their migratory movements, nutrition and other biological processes.

**Applied Biological Research**

1. Determination of the effects on salmon and trout stocks of environmental alteration caused by artificial factors:
   (a) Physical alteration, e.g.—increasing, lowering or fluctuating lake and stream levels — substituting reservoir environment for stream environment — imposition of delays, injury or mortality by presence of dams and/or associated structures.
   (b) Chemical alteration, e.g.—introduction of various chemical materials which may act directly as fish toxicants, or may produce indirect effects on salmon and trout performance, tolerance, sensory perception or behaviour.
   (c) Biological alteration, e.g.—introduction by damming or diverting watersheds of species of fish or other organisms which may compete with, prey upon, or parasitize indigenous salmon and trout stocks.
2. Assessment of effectiveness of fish passage and directing facilities:
   (a) Assessment of fish ladders, trapping and transporting devices and other methods of passing salmon and trout adults and young around barriers in route of migration.
   (b) Assessment of screens, light, bubbles, chains, electricity and other possible means of directing or guiding salmon and trout.

3. Assessment and developing of alternative methods of maintaining salmon and trout stocks:
   (a) Assessment of effectiveness of present methods of salmon and trout culture and stocking.
   (b) Development of new methods of increasing efficiency of salmon and trout culture and stocking.

**Applied Engineering Research**

1. Investigation of design and hydraulics of spillways, turbines and other structures in an attempt to eliminate or reduce features deleterious to salmon and trout migration or production.
2. Investigation of design and hydraulics of fish passes, guiding devices and other fish facilities which may be used to prevent delay, mortality or injury to migrating stocks of salmon and trout.
3. Design of salmon and trout rearing facilities or other structures associated with alternatives to the passage of these fish.

In the fulfillment of its terms of reference which provide for the protection, preservation and extension of the sockeye and pink salmon fisheries of the Fraser River the Commission in certain important instances has approached the limitations of the natural environment as a laboratory for providing adequate information.

The required and urgent research activities which now await the availability of a suitable research laboratory are:

1. An accurate measurement of the tolerance limits of a race of sockeye and pink salmon to changes in its fresh water environment; such changes being a potentiality under a multi-purpose development of the Fraser River watershed and being a major consideration in transplantation for restocking barren or potential producing areas.
2. A measurement of the physiological weaknesses inherent in present methods of artificial propagation as a prelude to the design of a successful system of producing fry as a substitute for lost or unstable spawning grounds, viz. Pitt and Birkenhead Rivers.
3. A measurement of the toxicity and stress created by the rapidly increasing and complex chemical nature of industrial pollution of the Fraser River from Prince George to Georgia Strait.

## PINK SALMON REPORT

The ratification of the Pink Salmon Protocol on July 3, 1957 transferred the primary responsibility for protecting, preserving and extending the pink salmon fishery of the Fraser River system to the International Pacific Salmon Fisheries Commission. Although the ratification of the Protocol occurred only a few weeks prior to the beginning of the 1957 run, the Commission immediately organized its management program with the result that a daily statistical record of the catch was obtained by gear and by areas within Convention waters. Reliable spawning enumeration methods were established. Studies are now fairly complete on the measurement of environmental factors functioning during the freshwater existence of the species. Surveys of the individual spawning areas are continuing so that reasonable limits can be placed on the size of future escapements required to return maximum runs. A primary statistical and historical analysis

of the fishery has been completed and associated with possible factors affecting survival of pink salmon both in fresh water and in the estuarial areas adjacent to the mouth of the Fraser River.

Unlike the sockeye populations in Convention waters, which originates almost solely in the Fraser River, the pink salmon in Convention waters are destined for a number of streams in addition to the Fraser River. Streams lying outside Convention waters in the State of Washington and in the Georgia Strait area of British Columbia produce pink salmon which contribute to the catches in Convention waters. The Commission has a responsibility not only to divide the pink salmon catch in Convention waters between the fishermen of the United States and Canada but to ensure that the runs of pink salmon, regardless of their destination, will not be placed in jeopardy by the fishery in Convention waters.

The complex origin of the pink salmon stocks contributing to the fishery in Convention waters was recognized in Article VI of the Pink Salmon Protocol which provides that "The Parties shall conduct a coordinated investigation of pink salmon stocks which enter Convention waters for the purpose of determining the migratory movements of such stocks". In order to comply with the provisions of the above article and to provide the required knowledge for proper scientific management of the fishery the following committee was assembled in 1957 by mutual agreement.

**Pink Salmon Coordinating Committee**

United States: Washington State Department of Fisheries
Milo Moore, Director
Clarence Pautzke, Assistant Director

Canada: Department of Fisheries
A. J. Whitmore, Director, Pacific Area

Fisheries Research Board of Canada
Dr. A. W. H. Needler, Director,
Pacific Biological Station

International Pacific Salmon Fisheries Commission
Loyd A. Royal, Director

The ratification of the Pink Salmon Protocol preceded the 1957 pink salmon run by too short a period for the Committee to organize a suitable field program for that year. Since 1957 the Committee has functioned effectively and has released an official report entitled "A Preliminary Review of Pertinent Past Tagging Investigations on Pink Salmon and Proposal for a Co-ordinated Research Program for 1959".

The proposed 1959 program includes extensive marine tagging and escapement enumeration. The purpose of the program is to provide detailed information on 1. The destination, migration routes, times of passage, catches, and exploitation rates of pink salmon stocks moving through fishing areas adjacent to

Convention waters but migrating to streams located in Convention waters and 2. Destination, migration routes, times of passage, catches, and exploitation rates in Convention waters of pink salmon passing through Convention waters en route to streams in outside areas.

Studies of environmental factors affecting the survival of Fraser River pink salmon stocks by the Commission staff have revealed certain relationships which appear to be fairly reliable in forecasting the adult survival rate one year in advance of the run—*providing adequate escapement is obtained.* The influencing factors include the Fraser River water temperature during December to February of the brood year and the mean surface seawater temperature in Georgia Strait during the spring and summer of the "even" years when the young fry enter and disperse for feeding prior to departure for the waters of the Pacific Ocean.

The following table shows the estimated annual catch as compared with the actual catch of the early pink run produced by the Fraser River. It is important to point out that the catches shown in the table include only the early run fish taken in Juan de Fuca Strait, San Juan Islands, and the Point Roberts area. Fraser River gill net catches are not included and the escapement is unknown except in 1957.

The water temperatures in both the Fraser River and Georgia Strait were excessively high in 1958, indicating a failure in the 1959 fishery. The negative figure shown for the 1959 estimated catch indicates within the probable error of the estimate of the catch that no fishery can operate if adequate escapement is to be obtained. This is a drastic departure from a normally expected catch especially since the brood year escapement was relatively good and the fry hatch was considered normal. If the actual run proves to be a relative failure as indicated by this method, an important tool will have been developed for designing regulatory control measures in advance of the season.

Estimates of early segment Fraser pink catch (in thousands) from multiple regression of Georgia Strait temperature and Fraser River temperature.

| *Year* | *Estimated Catch* | *Actual Catch* | *Error* | *Per Cent Error* |
|---|---|---|---|---|
| 1935 | 2309 | 3235 | —926 | 28.6 |
| 1937 | 2498 | 2086 | +412 | 19.8 |
| 1939 | 1570 | 2124 | —554 | 26.1 |
| 1941 | 1064 | 1039 | + 25 | 2.4 |
| 1943 | 417 | 263 | +154 | 58.6 |
| 1945 | 2302 | 2128 | +174 | 8.2 |
| 1947 | 3226 | 2433 | +793 | 32.6 |
| 1949 | 3378 | 3096 | +282 | 9.1 |
| 1951 | 4598 | 5070 | —472 | 9.3 |
| 1953 | 3890 | 4062 | —172 | 4.2 |
| 1955 | 3851 | 4160 | —309 | 7.4 |
| 1957 | 3379 | 2789 | +590 | 21.2 |
| 1959 | Minus 520 | | | |

## 1958 PUBLICATIONS

1. Annual Report of the International Pacific Salmon Fisheries Commission for 1957.

2. Progress Report.
   Sockeye and Pink Salmon Investigations at the Seton Creek Hydroelectric Installation, by F. J. Andrew and G. H. Geen.

3. Progress Report.
   An Examination of Factors Affecting the Abundance of Pink Salmon in the Fraser River, by E. H. Vernon.

## TABLE I
## SOCKEYE CATCH BY GEAR

*United States Convention Waters*

| Year | Purse Seines | | | Gill Nets | | | Reef Nets | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Units | Catch | Percentage | Units | Catch | Percentage | Units | Catch | Percentage | Catch |
| 1946 | 168 | 3,366,759 | 94.80 | 58 | 50,440 | 1.42 | 58 | 134,111 | 3.78 | 3,551,310 |
| 1950 | 288 | 1,061,480 | 86.94 | 205 | 82,854 | 6.79 | 96 | 76,559 | 6.27 | 1,220,893 |
| 1954 | 297 | 3,764,949 | 78.34 | 447 | 861,895 | 17.93 | 74 | 179,414 | 3.73 | 4,806,258 |
| 1958 | 368 | 4,259,324 | 81.02 | 689 | 844,602 | 16.06 | 82 | 152,158 | 2.89 | 5,257,316 |

*Canadian Convention Waters*

| Year | Purse Seines | | | Gill Nets | | | Traps | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| | Units | Catch | Percentage | Units | Catch | Percentage | Units | Catch | Percentage | Catch |
| 1946 | 132 | 1,646,689 | 38.84 | 1,843 | 2,555,955 | 60.27 | 5 | 37,554 | 0.89 | 4,240,198 |
| 1950 | 113 | 371,140 | 41.49 | 1,048 | 483,603 | 54.07 | 5 | 39,726 | 4.44 | 894,469 |
| 1954 | 236 | 2,410,564 | 51.04 | 1,798 | 2,265,335 | 47.97 | 3 | 32,822 | 0.70 | 4,722,463 |
| 1958 | 180 | 2,541,592 | 48.49 | 2,275 | 2,680,914 | 51.15 | 3 | 14,241 | 0.27 | 5,241,617 |

NOTE: Gear counts represent the maximum number of units delivering on any single day.

## Table II
## CYCLIC LANDINGS AND PACKS OF SOCKEYE

| | *United States* | *Canada* | *Total* |
|---|---|---|---|
| * 1958 | | | |
| Total Landings (No. Sockeye) | 5,257,316 | 5,241,617 | 10,498,933 |
| Share in Fish | 50.07% | 49.93% | |
| Total Pack (48 Lb. Cases) | 450,066 | 418,704** | 868,770 |
| Share in Pack | 51.80% | 48.20% | |
| 1954 | | | |
| Total Landings (No. Sockeye) | 4,806,258 | 4,722,463 | 9,528,721 |
| Share in Fish | 50.44% | 49.56% | |
| Total Pack (48 Lb. Cases) | 501,496 | 486,805 | 988,301 |
| Share in Pack | 50.74% | 49.26% | |
| 1946-1958 | | | |
| Total Landings (No. Sockeye) | 24,955,334 | 25,025,837 | 49,981,171 |
| Share in Fish | 49.93% | 50.07% | |
| Total Pack (48 Lb. Cases) | 2,226,071 | 2,195,142 | 4,421,213 |
| Share in Pack | 50.35% | 49.65% | |
| 1958 *Cycle Pack* | | | |
| 1958 | 450,066 | 418,704 | 868,770 |
| 1954 | 501,496 | 486,805 | 988,301 |
| 1950 | 116,458 | 81,510 | 197,968 |
| 1946 | 280,018 | 331,292 | 611,310 |
| 1942 | 263,458 | 426,979 | 690,437 |
| 1938 | 134,641 | 186,794 | 321,435 |
| 1934 | 352,579 | 139,238 | 491,817 |
| 1930 | 352,194 | 103,692 | 455,886 |
| 1926 | 44,673 | 85,689 | 130,362 |
| 1922 | 48,566 | 51,832 | 100,398 |
| 1918 | 50,723 | 19,697 | 70,420 |
| 1914 | 335,230 | 198,183 | 533,413 |
| 1910 | 248,014 | 150,432 | 398,446 |
| 1906 | 182,241 | 183,007 | 365,248 |
| 1902 | 339,556 | 293,477 | 633,033 |
| 1898 | 252,000 | 256,101 | 508,101 |
| 1894 | 41,300 | 360,000 | 401,300 |
| 1890 | — | 225,000 | 225,000 |

* 22 Canneries in the United States and 13 canneries in Canada received the sockeye caught in Convention waters.

** Includes 3,839 cases packed in the United States from Canadian caught sockeye.

## TABLE III

## DAILY CATCH OF SOCKEYE 1946-1950-1954-1958 FROM UNITED STATES CONVENTION WATERS

| Date | JULY | | | | AUGUST | | | | SEPTEMBER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1946 | 1950 | 1954 | 1958 | 1946 | 1950 | 1954 | 1958 | 1946 | 1950 | 1954 | 1958 |
| 1 | | | 1,332 | | 10,851 | 15,403 | | | 53,804 | 343 | 472,636 | 170,851 |
| 2 | | | 6,000 | | 8,930 | 20,880 | 31,848 | | 131,748 | 42 | 446,988 | 326,985 |
| 3 | | | | | | 25,058 | 40,479 | | 92,579 | 16 | 173,977 | 218,734 |
| 4 | | | | | 12,163 | | 40,377 | 27,727 | 71,241 | 3 | | 182,786 |
| 5 | | | 16,232 | | 7,745 | | 29,883 | 17,775 | 62,452 | 18 | | 255,777 |
| 6 | | | 8,509 | | 15,543 | 16,961 | 35,902 | 9,487 | 79,725 | | 117,704 | 361,549 |
| 7 | | | 6,623 | | 34,751 | 34,588 | | | | 968 | 115,016 | 278,615 |
| 8 | | | 12,660 | | 47,971 | 48,134 | | | 41,085 | 713 | 66,966 | 251,993 |
| 9 | | | 8,676 | | 38,902 | 41,470 | 93,065 | | 94,111 | | 71,330 | 270,107 |
| 10 | | | | | | 36,990 | 107,428 | | 103,522 | 207 | 42,100 | 99,661 |
| 11 | | | | | 23,838 | | 91,372 | 47,567 | 92,895 | 393 | 10,441 | 83,546 |
| 12 | | | 22,095 | | 23,799 | | 97,970 | 52,695 | 13,347 | 297 | 7,646 | 74,326 |
| 13 | | | 18,854 | | 29,522 | 55,865 | 46,821 | 48,391 | 7,562 | 56 | 8,952 | 71,025 |
| 14 | | | 10,979 | | 35,193 | 26,563 | | | | 62 | 8,796 | 100,305 |
| 15 | | | 10,248 | | 34,903 | 18,115 | | | 8,342 | 46 | 10,409 | 44,837 |
| 16 | | | 12,450 | | 43,047 | 36,042 | 37,003 | | 8,599 | | 2,412 | 22,421 |
| 17 | | | | | | 52,889 | 74,421 | | 21,893 | 898 | 1,229 | 80,171 |
| 18 | | | | | 27,381 | | 39,791 | | 9,173 | 483 | 635 | 13,319 |
| 19 | | | 38,708 | | 43,713 | | 28,893 | | 11,005 | 2,427 | 397 | 4,598 |
| 20 | | | 30,461 | | 63,070 | 138,217 | 58,738 | 52,209 | 705 | 365 | 1,328 | |
| 21 | | | 27,871 | 4,025 | 64,503 | 153,568 | | 67,370 | | 124 | 1,399 | |
| 22 | | | 24,719 | 6,204 | 55,089 | | 91,515 | 63,193 | 4,882 | 67 | 1,239 | 22,260 |
| 23 | | | 32,768 | 4,349 | 54,416 | 100,173 | 114,790 | | 2,197 | | 457 | 277,405 |
| 24 | | | | | | 131,748 | 84,516 | | 1,696 | 12 | 308 | 6,769 |
| 25 | 305 | | | | 89,452 | 107,788 | 135,827 | 162,910 | 1,846 | 21 | 24 | 17,815 |
| 26 | 87 | | 1,325 | | 134,956 | | 167,812 | 116,826 | | 14 | 358 | |
| 27 | | | 75,112 | | 290,642 | 83,504 | 233,032 | 156,127 | CLOSED | 17 | 401 | |
| 28 | 172 | | 51,961 | 19,974 | 542,836 | 38,212 | | 196,017 | | 18 | 430 | |
| 29 | 321 | | 43,253 | 10,697 | 366,879 | | 406,321 | 218,465 | | 11 | 159 | 42,564 |
| 30 | 189 | | 35,277 | 8,258 | 531,426 | 16,818 | 292,094 | 249,134 | | | 96 | 145,499 |
| 31 | 4,302 | 14,286 | | | | | 359,913 | 173,664 | | | | |
| Totals | 5,376 | 14,286 | 496,113 | 53,507 | 2,631,521 | 1,198,986 | 2,739,811 | 1,659,557 | 914,409 | 7,621 | 1,563,833 | 3,423,918 |
| June Total | | | 6,033 | 5 | | | | | | | | |
| Oct. Total | | | | | | | | | 4 | | 468 | 120,329 |
| Season Totals | | | | | | | | | 3,551,310 | 1,220,893 | 4,806,258 | 5,257,316 |

CLOSED

CLOSED

CLOSED

## Table IV

## DAILY CATCH OF SOCKEYE 1946-1950-1954-1958 FROM CANADIAN CONVENTION WATERS

| Date | JULY | | | | AUGUST | | | | SEPTEMBER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1946 | 1950 | 1954 | 1958 | 1946 | 1950 | 1954 | 1958 | 1946 | 1950 | 1954 | 1958 |
| 1 | CLOSED | CLOSED | 2,204 | 831 | 946 | 25,874 | | | | 312 | 91,065 | 385,985 |
| 2 | | | 252 | 1,697 | 947 | 26,390 | 152,661 | | 67,498 | | 152,331 | 466,682 |
| 3 | | | | | | 30,775 | 72,581 | | 146,709 | 120 | 120,485 | 401,994 |
| 4 | | | | | | | 34,608 | 22,789 | 190,107 | 19,760 | | 458,319 |
| 5 | | | 14,601 | | 72 | | 58,230 | 7,329 | 144,135 | 12,062 | 9,963 | 176,108 |
| 6 | | | 10,426 | | 230 | 11,031 | 37,383 | 5,701 | 93,529 | 26,320 | 166,818 | |
| 7 | | | 7,711 | 7,251 | 71 | 53,074 | | | | 978 | 128,713 | |
| 8 | | | 7,814 | 4,924 | 14,075 | 31,653 | | | | 150 | 96,413 | 159,235 |
| 9 | | | 502 | 7,156 | 7,475 | 20,121 | 423 | | 120,686 | | 101,374 | 199,510 |
| 10 | | | | | | 21,189 | 3,742 | | 84,121 | 307 | 148,585 | 141,028 |
| 11 | | | | | | 296 | 3,897 | 36,849 | 599,942 | 50 | | 145,473 |
| 12 | | | 9,667 | | 61,254 | | 4,710 | 13,353 | 80,620 | 50 | | 130,619 |
| 13 | | | 8,448 | | 29,700 | 14,679 | 1,432 | 13,826 | 312,505 | 58 | 206,257 | |
| 14 | | | 7,200 | 14,125 | 21,513 | 49,953 | | | | 16 | 151,204 | |
| 15 | | | 7,159 | 11,791 | 16,307 | 29,973 | | 127 | | 16 | 180,631 | 2,486 |
| 16 | | | 1,938 | 16,229 | 18,042 | 32,366 | 108,875 | 215 | 327,366 | | 85 | 2,192 |
| 17 | | | | | | 38,300 | 92,754 | 225 | 218,704 | 16 | 569 | 1,974 |
| 18 | | | | | | | 80,512 | 292 | 162,323 | 15 | 901 | 860 |
| 19 | | | 18,838 | | 53,008 | | 57,100 | 293 | 151,372 | 15 | 904 | 304 |
| 20 | | | 13,149 | | 22,382 | 71,775 | 8,188 | 105,604 | 82 | 15 | 356 | 3 |
| 21 | | | 10,963 | 12,153 | 22,574 | 42,085 | | 241,332 | | 10 | 606 | 27 |
| 22 | | | 16,266 | 6,650 | 27,513 | 29,217 | | 284,809 | | 8 | 313 | 92 |
| 23 | | | 9,088 | 9,359 | 33,499 | 45,742 | 159,874 | | 356,118 | | 307 | 74 |
| 24 | | | | | | 52,525 | 235,418 | 217 | 202,150 | 2 | 97 | 66 |
| 25 | 275 | | | | | 21,972 | 213,529 | 196,169 | 25 | 29,233 | 47,355 | 35 |
| 26 | 275 | | 71,681 | | 165,805 | | 539,766 | 219,173 | | 10,835 | 15,658 | 303 |
| 27 | | | 41,923 | | 324,065 | 3,118 | 265,506 | 339,204 | | 10,663 | 10,204 | 486 |
| 28 | | | 33,239 | 19,368 | 89,112 | 40,252 | | 315,813 | CLOSED | 4,980 | 19,086 | 714 |
| 29 | 187 | | 33,734 | 9,534 | 36,545 | 19,577 | | 196,289 | | | 9,287 | 484 |
| 30 | 188 | | 17,754 | 11,565 | 29,361 | 13,918 | 520,223 | | | | 4,435 | 391 |
| 31 | 188 | 31,679 | | | | 7,737 | 48,515 | | | | | |
| Totals | 1,113 | 31,679 | 341,557 | 132,633 | 974,496 | 733,592 | 2,699,927 | 1,999,609 | 3,257,992 | 115,991 | 1,664,002 | 2,675,444 |
| 8″ Gill Nets | 1,027 | | | | 1,126 | | | | | | | |
| May & June Totals | 575 | 2,042 | 7,990 | 1,059 | | | | | | | | |
| Oct. & Nov. Totals | | | | | | | | | 3,869 | 11,165 | 5,987 | 432,872 |
| Season Totals | | | | | | | | | 4,240,198 | 894,469 | 4,722,463 | 5,241,617 |

TABLE V

## THE INDIAN CATCHES OF SOCKEYE SALMON BY DISTRICTS AND THE VARIOUS AREAS WITHIN THESE DISTRICTS, 1954, 1958

| | 1954 | | 1958 | |
|---|---|---|---|---|
| *District and Area* | *Catch* | *No. of Fishermen* | *Catch* | *No. of Fishermen* |
| HARRISON-BIRKENHEAD | | | | |
| Skookumchuck and Douglas | 1,430 | — | 1,000 | — |
| Birkenhead River and Lillooet Lake | 3,501 | — | 3,417 | — |
| Harrison and Chehalis | | | 1,550 | — |
| TOTALS | 4,931 | — | 5,967 | — |
| LOWER FRASER | | | | |
| Coquitlam to Chilliwack | | | 8,765 | — |
| Chilliwack to Hope | | | 8,170 | — |
| Vedder River and Vicinity | | | 1,375 | — |
| TOTALS | 7,240 | 182* | 18,310 | — |
| CANYON | | | | |
| Hope to Lower Gorge | 7,745 | | 4,665 | — |
| Upper Gorge to North Bend | 8,347 | | 1,225 | — |
| TOTALS | 16,092 | 234* | 5,890 | — |
| LYTTON-LILLOOET | | | | |
| North Bend to Lillooet | 10,264 | 89 | 2,800 | — |
| TOTALS | 10,264 | 89* | 2,800 | — |
| BRIDGE RIVER RAPIDS | | | | |
| Rapids to Pavillion | 9,861 | 85 | 4,700 | — |
| TOTALS | 9,861 | 85* | 4,700 | — |
| CHILCOTIN | | | | |
| Farwell Canyon | 1,299 | 11 | 1,304 | — |
| Hances Canyon | 976 | 10 | 1,383 | — |
| Alexis Creek | 1,348 | 15 | 3,003 | — |
| Siwash Bridge | 2,240 | 21 | 2,434 | — |
| Keighley Holes | 195 | 6 | 1,240 | — |
| TOTALS | 6,058 | 63 | 9,364 | — |
| UPPER FRASER | | | | |
| Shelley | 171 | 8 | 192 | — |
| Alkali and Canoe Creek | 450 | 21 | 250 | — |
| Chimney Creek | 1,489 | 31 | 260 | — |
| Soda Creek | 594 | 14 | 220 | — |
| Alexandria | 56 | 2 | 185 | — |
| Quesnel | 210 | 4 | 280 | — |
| TOTALS | 2,970 | 80* | 1,387 | — |
| NECHAKO | | | | |
| Nautley Reserve | 1,026 | 9 | 2,342 | 13 |
| Stella Reserve | 1,297 | 10 | 2,967 | 14 |
| TOTALS | 2,323 | 19* | 5,309 | 27 |
| STUART | | | | |
| Fort St. James | 2,743 | 35 | 3,573 | 37 |
| Tachie, Pinchi and Trembleur Villages | 1,947 | 25 | 2,015 | 17 |
| TOTALS | 4,690 | 60 | 5,588 | 54 |
| THOMPSON | | | | |
| North Thompson River | 200 | | 250 | — |
| South Thompson River | 21,500 | | 16,000 | — |
| Thompson River | 8,405 | | 6,800 | — |
| TOTALS | 30,105 | 155* | 23,050 | — |
| GRAND TOTALS | 94,534 | | 82,365 | |

* Number of permits issued to Indians in district.

The Indian catch statistics detailed above are obtained principally from the Protection Officers of the Canadian Department of Fisheries. These officers control the taking of sockeye for food by the Indian population residing throughout the Fraser River watershed.

## Table VI

## SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1946, 1950, 1954, 1958

| District and Streams | 1958 Period of Peak Spawning | Estimated Number of Sockeye | | | | Jacks | Sex Ratio | |
|---|---|---|---|---|---|---|---|---|
| | | 1946 | 1950 | 1954 | 1958 | | Males 4-5 yr. | Females 4-5 yr. |
| **Lower Fraser** | | | | | | | | |
| Cultus Lake | Nov. 25-Dec. 1 | 33,284 | 30,595 | 23,756 | 14,097 | 773 | 5,794 | 7,530 |
| Upper Pitt River | Sept. 15-23 | 18,520 | 42,800 | 17,624 | 10,385 | 4 | 3,663 | 6,718 |
| Widgeon Slough | Nov. 5-10 | 1,404 | 600 | 1,000 | 1,152 | 66 | 543 | 543 |
| **Harrison** | | | | | | | | |
| Big Silver Creek | | — | 25 | 279 | — | — | — | — |
| Harrison River | Nov. 10-15 | 15,631 | 33,860 | 28,800 | 14,701 | 0 | 8,247 | 6,454 |
| Weaver Creek | Oct. 20-25 | 36,000 | 30,700 | 28,773 | 36,199 | 260 | 14,126 | 21,813 |
| Misc. Streams | | 1,200 | 350 | — | — | — | — | — |
| **Lillooet** | | | | | | | | |
| Birkenhead River | Sept. 26-29 | 90,000 | 72,767 | 41,201 | 33,055 | 17,889 | 9,030 | 6,136 |
| **Seton-Anderson** | | | | | | | | |
| Gates Creek | Sept. 12-14 | — | — | 47 | 81 | 20 | 30 | 31 |
| Portage Creek | Nov. 7-11 | — | few | 3,505 | 4,803 | 12 | 2,020 | 2,771 |
| **South Thompson** | | | | | | | | |
| Seymour River | Sept. 7-10 | 2,600 | 12,000 | 26,258 | 78,575 | 207 | 33,681 | 44,687 |
| Upper Adams River | Sept. 9-12 | 0 | 0 | 205 | Present | | | |
| Lower Adams River | Oct. 25-Nov. 5 | 1,841,000 | 850,500 | 1,532,820 | 1,730,609 | 3,461 | 930,722 | 796,426 |
| Little River | Nov. 1-8 | 419,000 | 376,000 | 427,850 | 409,480 | 1,516 | 142,376 | 265,588 |
| South Thompson River | Nov. 1-8 | 92,000 | 41,500 | 87,611 | 123,864 | 198 | 43,278 | 80,388 |
| Lower Shuswap River | Nov. 3-5 | — | — | 17,462 | 9,387 | 20 | 3,853 | 5,514 |
| Middle Shuswap River | Oct. 28-Nov. 3 | 0 | 0 | 0 | 499 | 0 | 206 | 293 |
| Diverted Sockeye | | 0 | 0 | 0 | 1,006,177 | 3,370 | 389,045 | 613,762 |
| **North Thompson** | | | | | | | | |
| Raft River | Sept. 5-9 | 3,000 | 6,400 | 10,551 | 10,215 | 1 | 3,916 | 6,298 |
| **Chilcotin** | | | | | | | | |
| Chilko River | Sept. 27-30 | 58,950 | 29,800 | 36,534 | 137,081 | 16,977 | 49,600 | 70,504 |
| Taseko Lake | Sept. 3-6 | — | 500 | 3,500 | 7,538 | 25 | 3,199 | 4,314 |
| **Quesnel** | | | | | | | | |
| Horsefly River | Sept. 7-10 | 58 | 400 | 279 | 1,784 | 0 | 535 | 1,249 |
| Mitchell River | Sept. 23-25 | 2 | 0 | 18 | 65 | 0 | 32 | 33 |
| Little Horsefly River | Oct. 15-20 | — | — | — | 14 | 0 | 7 | 7 |
| **Nechako** | | | | | | | | |
| Endako River | Sept. 1-3 | 368 | 900 | Present | 522 | 0 | 261 | 261 |
| Nadina River | Sept. 12-18 (Early) | | | | | | | |
| | Sept. 20-24 (Late) | 66 | 1,950 | 2,219 | 804 | 0 | 358 | 446 |
| Nithi River | | 4 | 125 | 46 | 5 | 0 | 0 | 5 |
| Ormonde Creek | Sept. 5-7 | 193 | 732 | 538 | 210 | 0 | 105 | 105 |
| Stellako River | Sept. 29-Oct. 4 | 245,200 | 145,100 | 142,632 | 112,273 | 22 | 50,302 | 61,949 |
| Uncha Creek | Sept. 24-26 | — | — | — | 25 | 0 | 12 | 13 |
| **Stuart Lake** | | | | | | | | |
| *Early Runs* | | | | | | | | |
| Ankwil Creek | Aug. 16-20 | — | 67 | 56 | 461 | 0 | 184 | 277 |
| Bivouac Creek | | — | 2,320 | 387 | 3 | 0 | 1 | 2 |
| Driftwood River | Aug. 16-22 | 5 | 144 | 387 | 1,897 | 0 | 759 | 1,138 |
| Dust Creek | Aug. 4-12 | — | 1,125 | 1,168 | 3,017 | 0 | 1,207 | 1,810 |
| Felix Creek | Aug. 3-6 | — | — | 218 | 515 | 0 | 206 | 309 |
| 15 Mile Creek | Aug. 16-20 | — | 54 | 41 | 105 | 0 | 42 | 63 |
| 5 Mile Creek | Aug. 16-20 | — | 262 | 5 | 111 | 0 | 44 | 67 |
| Forfar Creek | Aug. 4-12 | 1,822 | 10,259 | 5,702 | 8,715 | 0 | 3,541 | 5,174 |
| Forsythe Creek | | — | 2 | 27 | 0 | 0 | 0 | 0 |
| Frypan Creek | Aug. 16-20 | — | 69 | 266 | 57 | 0 | 23 | 34 |
| Gluske Creek | Aug. 4-12 | 2,905 | 11,007 | 5,292 | 1,642 | 0 | 657 | 985 |
| Kynoch Creek | Aug. 3-12 | 1,843 | 24,644 | 14,088 | 9,477 | 1 | 3,923 | 5,553 |
| Leo Creek | Aug. 9-12 | — | 97 | 4 | 234 | 0 | 94 | 140 |
| Narrows Creek | Aug. 4-12 | 277 | 2,265 | 2,756 | 1,823 | 0 | 720 | 1,103 |
| Paula Creek | Aug. 3-6 | — | — | 36 | 333 | 0 | 133 | 200 |
| Rossette Creek | Aug. 3-12 | 2,641 | 6,260 | 3,836 | 3,735 | 4 | 1,492 | 2,239 |
| Sakeniche River | Aug. 9-12 | — | 234 | — | 500 | 0 | 200 | 300 |
| Sandpoint Creek | Aug. 4-12 | — | — | 508 | 875 | 0 | 350 | 525 |
| Shale Creek | Aug. 16-20 | 61 | 628 | 279 | 657 | 0 | 263 | 394 |
| 25 Mile Creek | Aug. 16-20 | — | 521 | 207 | 218 | 0 | 87 | 131 |
| Misc. Streams | Aug. 4-20 | — | 42 | 23 | 258 | 0 | 103 | 155 |
| *Late Runs* | | | | | | | | |
| Kazcheck Creek | Sept. 17-20 | 60 | 243 | 83 | 369 | 0 | 163 | 206 |
| Middle River | Sept. 17-24 | 488 | 2,600 | 3,927 | 7,762 | 0 | 3,432 | 4,330 |
| Pinchi Creek | Oct. 6-12 | — | — | 5 | 850 | 0 | 376 | 474 |
| Tachie River | Sept. 18-24 | 14 | 200 | 1,529 | 13,738 | 19 | 6,064 | 7,655 |
| **Northeast** | | | | | | | | |
| Upper Bowron River | | 6,951 | 16,266 | 10,774 | 14,871 | 28 | 5,445 | 9,398 |
| **Totals** | | 2,875,547 | 1,756,913 | 2,485,112 | 3,815,823 | 44,873 | 1,724,450 | 2,046,500 |

## Table VII

## DAILY CATCH OF SOCKEYE, 1943-1947-1951-1955 FROM UNITED STATES TREATY WATERS

| Date | JULY | | | | AUGUST | | | | SEPTEMBER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1943 | 1947 | 1951 | 1955 | 1943 | 1947 | 1951 | 1955 | 1943 | 1947 | 1951 | 1955 |
| 1 | 2 | | | | 5,690 | 9 | 57,324 | 54,283 | 1,838 | 2,952 | | 3,094 |
| 2 | | | 13,102 | | 8,912 | 10 | 42,143 | 76,174 | 2,084 | 1,587 | 933 | 393 |
| 3 | | | 6,615 | | 14,001 | 4 | 27,199 | 46,271 | 1,270 | 1,181 | 544 | 4 |
| 4 | | | 9,589 | 7,228 | 14,738 | 6 | 0 | 1,453 | | 1,482 | 990 | 2,051 |
| 5 | | | 9,057 | 12,418 | 7,784 | 47 | 0 | 1,406 | 1,057 | 984 | 502 | 1,920 |
| 6 | | | 9,490 | 6,713 | 6,895 | 147 | 45,986 | | 931 | | 334 | 1,463 |
| 7 | 23 | | | 3,475 | 9,058 | 826 | 27,966 | 48,429 | 905 | 714 | 138 | 894 |
| 8 | 3 | | | | 3,746 | 46 | 33,746 | 82,783 | 1,302 | 622 | | 301 |
| 9 | 1 | | 23,677 | | 4,282 | 352 | 20,411 | 55,147 | 1,022 | 246 | 266 | 42 |
| 10 | 25 | | 10,244 | | 5,582 | 1,100 | 56 | 42,281 | 1,168 | 406 | 1,254 | 0 |
| 11 | 16 | | 8,156 | 7,863 | 10,623 | 526 | 0 | 28,216 | | 316 | 33,599 | 291 |
| 12 | 66 | | 6,570 | 8,435 | 10,375 | 559 | 0 | 1,806 | 210 | 248 | 6,580 | 274 |
| 13 | 178 | | 5,418 | 7,619 | 5,342 | 5 | 56,686 | | 357 | | 290 | 47 |
| 14 | 417 | | | 7,265 | 6 | 37 | 40,432 | 30,632 | 346 | 805 | 138 | 128 |
| 15 | 455 | | | | 8,479 | 45 | 40,912 | 38,577 | 225 | 106 | | 53 |
| 16 | 1,370 | | 16,435 | | 4,918 | 710 | 39,620 | 37,916 | 141 | 105 | 149 | 11 |
| 17 | 451 | | 16,565 | | 4,948 | | 23,050 | 46,499 | 45 | 443 | 234 | |
| 18 | 2,115 | | 12,476 | 17,079 | 5,912 | 4,379 | 310 | 29,174 | | 125 | 109 | 137 |
| 19 | 1,931 | | 13,506 | 17,791 | 4,554 | 8,743 | 396 | 5,763 | 18 | 240 | 109 | 71 |
| 20 | 4,345 | | 14,630 | 14,314 | 1,271 | 8,431 | 10,041 | 3,014 | 13 | | 285 | 77 |
| 21 | 2,335 | 6 | | 13,553 | 60 | 7,839 | 10,788 | 20,338 | 27 | 69 | 216 | 115 |
| 22 | 1,847 | 21 | | | 6,037 | 3,944 | 8,337 | 15,236 | 45 | 87 | | 79 |
| 23 | 1,754 | 9 | 58,796 | | 8,049 | 79 | 5,758 | 20,773 | 20 | 272 | 38 | 9 |
| 24 | 2,387 | | 59,917 | | 6,250 | 8,119 | 2,214 | 16,376 | 8 | 57 | 9 | |
| 25 | 5,592 | | 54,748 | 42,932 | 7,424 | 4,953 | 83 | 12,216 | | 36 | 14 | 32 |
| 26 | 5,266 | 8 | 45,817 | 15,254 | 5,017 | 5,894 | 4 | 3,705 | 3 | 42 | 7 | 6 |
| 27 | 3,248 | 14 | 42,981 | 30,881 | 2,280 | 6,234 | 2,471 | 789 | 8 | | 1 | 13 |
| 28 | 4,048 | | | 31,220 | | 5,536 | 7,489 | 9,584 | | 13 | 2 | 54 |
| 29 | 5,899 | | | | 3,849 | 3,097 | 2,334 | 5,633 | 3 | 6 | | 17 |
| 30 | 4,547 | | 64,435 | | 2,911 | 7 | 1,346 | 5,848 | 2 | 10 | | 4 |
| 31 | 68 | | 79,869 | | 1,497 | 3,316 | 859 | 5,766 | | | | |
| Totals | 48,389 | 58 | 582,093 | 244,040 | 180,490 | 75,000 | 507,961 | 746,088 | 13,048 | 13,154 | 46,741 | 11,580 |
| June Total | 150 | | | 4,870 | | | | | | | | |
| Oct. Total | | | | | | | | | | 8 | | 32 |
| Season Totals | | | | | | | | | 242,077 | 88,220 | 1,136,795 | 1,006,610 |

## Table VIII

## DAILY CATCH OF SOCKEYE, 1943-1947-1951-1955 FROM CANADIAN TREATY WATERS

| Date | JULY | | | | AUGUST | | | | SEPTEMBER | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1943 | 1947 | 1951 | 1955 | 1943 | 1947 | 1951 | 1955 | 1943 | 1947 | 1951 | 1955 |
| 1 | 85 | | | | | | 34,757 | 12,542 | 5,671 | 508 | | 6,361 |
| 2 | 81 | | 24,501 | | 10,977 | | 50,315 | 53,549 | 8,391 | 229 | 52 | 486 |
| 3 | | | 16,133 | | 10,070 | | 14,127 | 44,541 | 140 | 216 | 32,198 | |
| 4 | | | 13,850 | 8,734 | 8,086 | | | 41,759 | | 646 | 15,955 | |
| 5 | 98 | | 14,078 | 13,388 | 7,688 | | | 14,804 | | 138 | 12,617 | 22,777 |
| 6 | 123 | | 1,500 | 9,539 | 1,557 | | 63,292 | | 15,811 | 113 | 10,675 | 17,051 |
| 7 | 148 | | | 7,306 | | | 30,490 | | 5,099 | 8 | 6 | 14,849 |
| 8 | 155 | | | | | | 33,448 | 20,852 | 2,176 | 15,158 | | 12,715 |
| 9 | 247 | | 20,406 | | 8,469 | | 29,668 | 64,396 | 2,250 | 9,684 | 20 | 128 |
| 10 | | | 11,909 | | 5,114 | | 18,040 | 61,113 | 53 | 6,796 | 15,622 | |
| 11 | | | 8,186 | 5,701 | 6,238 | | | 66,168 | | 5,537 | 7,739 | |
| 12 | 395 | | 9,464 | 5,122 | 7,759 | | | 38,231 | | 52 | 9,229 | 146 |
| 13 | 365 | | 3,000 | 5,984 | 901 | | 59,457 | 3,291 | 3,567 | 37 | 12,047 | 31,216 |
| 14 | 510 | | | 5,961 | | | 27,445 | | 1,895 | 5 | 25 | 16,852 |
| 15 | 1,311 | | | | | | 13,579 | 41,110 | 2,158 | 25,814 | | 29 |
| 16 | 1,444 | | 15,184 | | 10,597 | | 8,442 | 52,827 | 3,916 | 29,309 | 4 | 3 |
| 17 | | | 10,116 | | 10,765 | | 2,453 | 31,418 | | 44,304 | 40,944 | |
| 18 | | | 10,134 | 9,594 | 9,288 | 1,827 | | 29,694 | | 39,708 | 27,599 | |
| 19 | 4,480 | | 13,384 | 7,856 | 9,166 | 2,115 | 1,541 | 16,722 | | 0 | 19,424 | 9 |
| 20 | 4,617 | | 1,580 | 10,931 | 417 | 1,342 | 22,812 | | 31,655 | | 313 | 8 |
| 21 | 3,916 | | | 20,597 | | 1,030 | 10,325 | | 13,962 | | 54 | 1 |
| 22 | 4,733 | | | | | 333 | 14,583 | 12,251 | 7,839 | 31,284 | | 404 |
| 23 | 4,905 | | 38,081 | | 7,659 | 34 | 16,428 | 27,306 | 6,601 | 33,250 | 0 | 1 |
| 24 | | | 30,178 | | 3,966 | 15 | 392 | 24,544 | | 54,538 | 24,783 | |
| 25 | | | 32,319 | 59,104 | 5,397 | 1,339 | | 21,648 | | 22,593 | 12,057 | |
| 26 | 5,707 | | 43,327 | 45,659 | 6,534 | 904 | 305 | 7,517 | | 21 | 5,139 | |
| 27 | 6,108 | | 10,313 | 26,664 | 203 | 530 | 46,086 | | 21,961 | 3 | | |
| 28 | 4,549 | | | 14,164 | | 1,093 | 23,673 | | 8,167 | | | |
| 29 | 5,652 | | | | | 548 | 17,925 | 4,357 | 4,242 | 5,404 | | 368 |
| 30 | 455 | | 76,209 | | 8,978 | 440 | 20,425 | 20,417 | 3,648 | 1,572 | | |
| 31 | | | 39,931 | | 5,058 | 101 | 228 | 10,127 | | | | |
| Totals | 50,084 | | 443,783 | 256,304 | 144,887 | 11,651 | 560,236 | 721,184 | 149,202 | 326,927 | 246,502 | 123,404 |
| 8″ Gill Nets | | 3,469 | | | | 5,165 | | | | | | |
| May & June Totals | 669 | 1,096 | 31,021 | 4,074 | | | | | | | | |
| Oct. & Nov. Totals | | | | | | | | | 4,169 | 6,727 | 6,620 | 3,115 |
| Season Totals | | | | | | | | | 349,011 | 355,035 | 1,288,162 | 1,108,081 |

## TABLE IX
## SUMMARY OF THE SOCKEYE ESCAPEMENT TO THE FRASER RIVER SPAWNING AREAS, 1943, 1947, 1951, 1955

| District and Streams | Period of Peak Spawning | Estimated Number of Sockeye | | | |
|---|---|---|---|---|---|
| | | 1943 | 1947 | 1951 | 1955 |
| LOWER FRASER | | | | | |
| Cultus Lake | Nov. 20-25 | 11,875 | 8,898 | 13,143 | 26,000 |
| Upper Pitt River | Sept. 10-17 | Present | 90,000 | 37,837 | 17,552 |
| Widgeon Slough | | 293 | 750 | 745 | —— |
| HARRISON | | | | | |
| Big Silver Creek | | Present | —— | 200 | 191 |
| Harrison River | Nov. 16-20 | 1,114+ | 16,000 | 17,145 | 5,595 |
| Weaver Creek | Oct. 19-21 | 3,128 | 6,500 | 12,979 | 21,330 |
| LILLOOET | | | | | |
| Birkenhead River | Sept. 23-25 | 50,668 | 120,000 | 55,862 | 25,355 |
| SETON-ANDERSON | | | | | |
| Gates Creek | Sept. 1-6 | —— | —— | —— | 86 |
| Portage Creek | Oct. 15-20 | —— | 50 | 30 | 43 |
| SOUTH THOMPSON | | | | | |
| Seymour River | Aug. 26-30 | Present | 10,000 | 24,344 | 9,511 |
| Lower Adams River | Oct. 18-22 | 10,000 | 185,000 | 135,000 | 54,405 |
| Little River | Oct. 15-20 | Present | 15,000 | 9,690 | 9,072 |
| South Thompson River | | —— | 100 | 500 | 0 |
| Lower Shuswap River | | —— | 0 | 0 | 23 |
| NORTH THOMPSON | | | | | |
| Raft River | Aug. 29-Sept. 1 | 4,000 | 8,000 | 8,561 | 5,364 |
| Barriere River | Sept. 1-3 | —— | —— | 108 | 103 |
| CHILCOTIN | | | | | |
| Chilko River | Sept. 23-25 | 13,546 | 55,000 | 118,110 | 128,081 |
| Taseko Lake | Aug. 31-Sept. 4 | —— | —— | 500 | 4,400 |
| QUESNEL | | | | | |
| Horsefly River | | —— | 6 | 51 | 62 |
| NECHAKO | | | | | |
| Endako River | Sept. 2-4 | 46 | 450 | 742 | 594 |
| Nadina River | Aug. 29-30 | —— | 90 | 326 | 202 |
| Nithi River | Aug. 24-31 | —— | 60 | 90 | 79 |
| Ormonde Creek | Aug. 29-31 | —— | 40 | 120 | 27 |
| Stellako River | Sept. 23-26 | 9,142 | 55,000 | 96,200 | 51,971 |
| STUART | | | | | |
| *Early Runs* | | | | | |
| Driftwood River | | —— | 0 | 50 | 0 |
| Forfar Creek | Aug. 11-13 | 400 | 1,500 | 13,600 | 68 |
| Frypan Creek | | —— | —— | 50 | 0 |
| Gluske Creek | Aug. 11-19 | —— | 200 | 3,787 | 99 |
| Kynoch Creek | Aug. 11-13 | 2,150 | 10,000 | 32,825 | 1,029 |
| Narrows Creek | Aug. 14-18 | 5 | 0 | 400 | 27 |
| Rossette Creek | Aug. 10-13 | 450 | 2,500 | 10,000 | 916 |
| Shale Creek | | —— | 0 | 190 | 0 |
| Misc. Streams | | —— | —— | 121 | 31 |
| *Late Runs* | | | | | |
| Kazchek Creek | Sept. 10-15 | 2 | —— | 200 | 18 |
| Middle River | Sept. 11-15 | —— | 60 | 2,000 | 3,596 |
| Tachie River | Sept. 15-20 | —— | —— | 100 | 4,000 |
| NORTHEAST | | | | | |
| Upper Bowron River | | 6,215 | 23,945 | 21,770 | 9,355 |
| TOTALS | | 113,034 | 609,149 | 617,376 | 379,185 |

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